

QUALITY ASSURANCE PROVISIONS (QAP)
FOR THE
PLUG, SOLID NOSE FUZE, MXU-735

I. QUALITY SYSTEM REQUIREMENTS

- A. The quality system requirements of ANSI/ASQC Q9002-1994 as tailored herein shall be implemented and maintained. The quality system shall be documented in a Quality System Plan in accordance with the applicable CDRL, ADL and this QAP. (Note: The following paragraph numbers and title references are to ANSI/ASQC Q9002-1994.)
1. Paragraph 4.5.3, Document And Data Changes. Add: The contractor shall implement a process to ensure the timely review, distribution, implementation, and maintenance of all authorized and released drawings, standards, specifications, and changes. The contractor shall maintain a record of change effectivity.
 2. Paragraph 4.6.2, Evaluation Of Subcontractors. Add: Subcontractors of material containing critical and/or major classification of characteristics shall have a quality system compliant, as a minimum, to ANSI/ASQC Q9002-1994.
 3. Paragraph 4.7, Control Of Customer-Supplied Product. Add: When property is furnished by the government, the contractor shall implement the following:
 - (a) Examination upon receipt, consistent with practicality, to detect damage upon transit;
 - (b) Inspection for completeness, quantity and proper type;
 - (c) Periodic inspection and precautions to assure adequate storage conditions and to guard against damage from handling and deterioration during storage;
 - (d) Identification and protection from improper use or disposition.
 4. Paragraph 4.9, Process Control. Add: Controlled conditions shall include:
 - (a) Preparation of documented process monitoring and operator instructions for all processes that affect product quality. These instructions are to be accessible at the point where work is performed.
 - (b) Accountability for all product and evidence that all manufacturing and inspection operations have been completed in sequence, as planned, or as otherwise documented and authorized.
 - (c) Development and implementation of a statistical process control (SPC) program for selected processes, following the guidance and definitions of recognized statistical process control documentation (e.g., IPC-9191) to monitor and reduce process variation and establish process capability. Selected processes shall include, as a minimum, those contributing to the quality of product critical and major characteristics. Evaluation shall be performed to determine and document the relationship of process parameters to the product characteristics. Evidence of process and product variation shall be documented using appropriate control charts. These charts shall be analyzed in real time. Once control limits are established, they shall be recalculated whenever substantial changes in the process are evident. When a plotted point for a characteristic falls outside the control limits, sources of variation, including special and common causes and gage accuracy and repeatability, shall be identified and minimized. Once SPC has been established, the process capability or potential index (CP) shall be determined. Action plans shall be implemented to reduce variation and improve each process with a current

- process performance index (CPk) of less than 1.33. The SPC program shall be documented in accordance with the applicable CDRL and DID.
5. Paragraph 4.10, Inspection and Testing. Add: The contractor shall perform 100 percent inspection or acceptance sampling in combination with SPC for in-process inspection and final inspection for each characteristic.
 6. Paragraph 4.11, Control of Inspection, Measuring and Test Equipment. Add: The contractor's calibration system shall be in accordance with ANSI/NCSL Z540-1-1994.
 7. Paragraph 4.13.1, General. Add: This element applies to suspect product as well as to nonconforming product.
 8. Paragraph 4.13.2, Review and Disposition of Nonconforming Product. Add:
 - (a) The proposed use or repair of product, which does not conform to specified requirements, shall be submitted to the government prior to use or repair. Repetitive nonconformances will not be approved.
 - (b) The contractor shall promptly notify the government when a nonconformance is found in the contractor's processes or products that may affect product already delivered.
 9. Paragraph 4.14, Corrective and Preventive Action. Add: Corrective action shall be required of a subcontractor when it is determined that the root cause of a nonconformity is the responsibility of the subcontractor.
 10. Paragraph 4.15.3, Storage. Add: Product removed from stock shall be reviewed to ensure conformance to contract, drawing, and specification requirements.
 11. Paragraph 4.17, Internal Quality Audits. Add: At least annually, the contractor shall conduct an internal audit to ensure quality system requirements with the requirements herein.
 12. Paragraph 4.20, Statistical Techniques. Add: Basic statistical concepts such as variation, control, stability, and capability shall be understood by contractor personnel monitoring, assessing, and adjusting processes.
- B. The QSP shall document the details of the contractor's quality system, including management commitment to quality, system elements, policy and practices. This Plan provides the government a basis for assessment of the quality system and evidence of the contractor's intent to comply with the contract quality requirements.
1. The quality system plan shall be in accordance with the contract quality system requirements. The QSP shall include traceability from the specific quality elements therein to the specific contractor processes which support those elements. The QSP shall include:
 - (a) A summary of the contract quality requirements and
 - (b) A relational matrix to indicate the general relationship between the contractor's quality system procedures/processes and the applicable quality system elements. The matrix, or an attachment thereto, shall also identify schedules or quality activities and tasks which must be coordinated and compatible with other schedules prepared for work under the contract, as well as include the name(s) of the person(s) responsible for accomplishments of activities and tasks.
 2. The QSP shall identify the means by which the contractor will ensure quality system effectiveness and demonstrate comprehensive management and review of data, such that the results may be used to indicate trends and progress in quality of design, processes fabrication, assembly, test and acceptance as appropriate to the contract. The QSP shall describe what is measured, how often it is tracked, and who reviews and assures that appropriate action is initiated when trends are unfavorable.

3. The Inspection and Test Plan (ITP) shall form an integral part of the contractor's QSP.
 4. A copy of the contractor's quality manual, which describes the current quality system, shall be attached.
- C. The contractor's implementation of the quality system shall be supplemented by the following:
1. The contractor shall prepare an Inspection and Test Plan (ITP) in accordance with the following format herein, and the ITP shall become an integral part of the Quality System Plan (QSP).
 2. Plan acceptance requirements: The contractor shall submit the QSP/ITP at least 30 days prior to initiation of production or at least 30 days prior to scheduled first article test (if FAT is required). Allow 30 days for government review. The plan(s) shall be approved by the government prior to production and acceptance of product since the ITP represents the inspection methods for final acceptance. The plan(s) is subject to disapproval when it does not achieve its intended objective of preventing acceptance of nonconforming material. The contractor shall be responsible for any delays resulting from the late presentation of the plan(s) to the government for review and approval and any delays resulting from the presentation of inadequate or unacceptable plan(s).
 3. General format: The ITP shall at minimum contain the following (which must be typewritten or clearly printed):
 - (a) Cover sheet identifying item, contract number, and revision letter of the plan.
 - (b) All of the inspections and test required for acceptance of the item documented in accordance with the requirements of paragraph 4 herein.
 - (c) A section for gage and measurement equipment maintenance, recertification, and recalibration documented in accordance with the requirements of paragraph 5 herein.
 4. Format for documenting inspections: For each inspection and test, including those tests which are contained in specifications, specific instructions shall be prepared and shall contain the following:
 - (a) Identification of the item to be inspected or tested including part number, revision letter, and nomenclature.
 - (b) Identification of measuring and test equipment using appropriate identification data which is visible on the equipment. Standard instruments such as a caliper or micrometer do not require a one to one identification description and can be identified simply as "caliper" or "micrometer".
 - (c) The location of the characteristic such as the drawing sheet and zone or a brief description of the characteristic such that an inspector can identify it's location.
 - (d) A written procedure for performing the test or measurement when the characteristic is other than a simple plus or minus tolerance dimension which is measured by the use of a standard instrument such as a caliper or micrometer. The procedure may be placed in an appendix of the plan and referenced if the procedure is lengthy or repeatedly used.
 - (e) The manner in which the result of the inspection is to be recorded such as a particular data sheet.
 - (f) Criteria for passing or failing the inspection (such as the high and low limit for a particular dimension, a particular minimum tensile strength, minimum voltage, etc.).
 - (g) Details of the sampling plan to be used.

The above inspection format shall be used for all required inspections and tests regardless of whether the test is performed by a subcontractor. When tests are performed by a subcontractor, all of the above information shall be provided by the subcontractor or obtained by subsequent receipt inspection or final acceptance inspection by the prime contractor. When tests are performed by a subcontractor, the prime contractor shall review the relevant specifications and create a receipt inspection review sheet to review the subcontractor's inspection and test data to ensure that it conforms to contractual requirements. In-process or statistical production tests, which are used for purposes of manufacturing material, which will later be verified by an acceptance inspection, need not be documented in the plan.

5. Format for gage maintenance, recertification, and recalibration schedule: For each acceptance gage, or other measurement device used for final acceptance, the following information shall be documented in the ITP:
- (a) A description of the gage including identification data which is visible on the equipment.
 - (b) A schedule for recertification of the gage or measurement device in terms of gage passes or time limit.
 - (c) A copy of the Navy gage approval for MAJOR and CRITICAL dimensional characteristics showing the gage is adequate. Other MAJOR and CRITICAL characteristic inspection devices such as electrical inspection fixtures, hydraulic test equipment, etc., shall require design approval from the Naval Air Warfare Center Weapons Division, Point Mugu, CA, Code 478100E, through the Procurement Contracting Officer. A copy of the approval shall be included.
- D. Approved inspection equipment shall be made available for use by the government when required to determine conformance with contract requirements. If conditions warrant, contractor personnel shall be made available for operation of such devices and for verification of their accuracy and condition. For gages or other inspection equipment supplied by the government, the contractor shall provide for adequate protection against damage to the equipment. All methods of inspection are subject to disapproval should they be found later to be inadequate or they are not performing their intended function (i.e., nonconforming material is being accepted).

II. INSPECTION REQUIREMENTS

- A. Contractor, in performing sampling inspection of the product(s) being manufactured/delivered under this contract, shall, as a minimum, comply with the inspection requirements set forth below without jeopardizing quality:
- 1. Characteristics classified on the drawings or in separate documents as "CRITICAL" shall be inspected 100%.
 - 2. Characteristics classified on the drawings or in separate documents as "MAJOR" shall be inspected by characteristic using MIL-STD-1916, Verification Level (VL)-IV (Table II).
 - 3. Characteristics classified on the drawings or in separate documents as "MINOR" either listed or unlisted shall be inspected by characteristic using MIL-STD-1916, Verification Level (VL)-II (Table II).

NOTES:

1. The above criteria will apply except where sampling plans and acceptance criteria appear in the product and/or affiliated specifications, or where authorization to deviate from these requirements has been obtained in accordance with contract requirements.
2. MIL-STD-1916 forms the basis of the sampling inspection program. Those elements of MIL-STD-1916 related to the applicable sampling inspection will also apply (e.g., switching rules, non conformance disposition, etc.) Reduction of test and inspection requirements will be as defined elsewhere in the QAP and contract.
3. If the use of an alternate sampling plan (other than those specified above) is desired, it shall be documented in detail to show factors such as lot size, sample size, acceptance criteria, and operating characteristic curves, and submitted for approval in accordance with the contract requirements.
4. MIL-STD 1916 is not intended for use with destructive testing. Should sampling with destructive testing be required, an accompanying sampling plan will be provided in the technical documentation.
5. Characteristics other than product attributes-processing requirements specified on drawings which are classified as CRITICAL, MAJOR, MINOR, or unclassified are exempt from the inspection requirements of the plans above. However, these processes shall be controlled in accordance with the quality system requirements of the contract.

III. ACCEPTANCE REQUIREMENTS

A. First Article Test (FAT).

1. Prior to the start of regular production, the contractor shall manufacture and submit a first article sample using the methods and processes proposed for quantity production. The contractor shall inspect and test the first article sample to assure that it conforms to all the requirements specified by the contract or purchase order (e.g., the ADL, all drawings and related specifications and standards) and accompanied by verifiable inspection results, certified test reports, material certifications, etc. The contractor performed first article tests and inspections shall be witnessed by the QAR, as directed by the contracting office. The first article results will then be verified by the government procuring activity for conformance to contract or purchase order requirements.

The first article sample shall consist of:

- (a) Ten (10) completed units, meeting all drawing requirements except painting
 - (b) Three (3) completed units meeting all drawing requirements, including painting.
 - (c) One (1) container complete with packing.
2. Government First Article Verification shall consist of first article test and inspections performed or witnessed by the government procuring activity at the contractor's facility. During the government procuring activity first article verification, the contractor's gauges and other measuring and test devices necessary to assure that supplies conform to the contract or purchase order requirements will also be reviewed. The government procuring activity reserves the right to perform any of the inspections set forth in the contract or purchase order requirements as necessary to assure supplies conform to

these requirements. This shall include but not be limited to the use of government operated inspection laboratories. The contractor's measuring and test equipment shall be made available for use by the government representatives to determine conformance to contract or purchase order requirements. In addition, contractor's personnel shall be made available for operation of such devices and for verification of their accuracy. The government first article verification shall consist of:

- (a) Review of completed contractor first article testing results and associated data and facilities (first article samples, inspection/test procedures, results, material certifications, acceptance inspection equipment, test facilities, etc.)
 - (b) Reinspection of all critical, major, and minor dimensional inspection characteristics, and selected other dimensional characteristics.
3. **Materials, Design and Construction:** Materials, design and construction shall be in accordance with the requirements as defined by the contractor or purchase order. The contractor shall demonstrate by means of certification that only materials and components conforming to the contract or purchase order requirements have been used. Certification statements shall completely identify the material or component, indicate the specification or drawing (revisions and dates) applicable, the grade or type to which the material or components were tested, the number tested and quantitative requirements and results obtained during tests. The required data may be from the specific quantity of material or components used in the contract or from the manufacturing lot from which the material or components originated.
4. **First Article Approval:**
- (a) If the first article sample passes the criteria established in the inspections, tests and verification, it will be approved. If the first article sample fails any of the specified inspections and tests, the results will be evaluated by the government procuring activity. These results, together with the government engineering analysis of the first article sample, shall form the basis for corrective action by the contractor. Depending upon the degree of corrective action deemed necessary by the government, first article approval may be:
 - (1) Granted, in which case the contractor shall have first made the changes required by the government prior to the start of regular production.
 - (2) Withheld, and new sample shall be submitted for approval in place of the failed first article sample. The sample shall be subjected to the examinations and tests in which the failures occurred and any other examinations and tests of the first article inspection as required by the PCO.
 - (3) Withheld, and a new first article sample shall be submitted for approval.

In all cases the contractor shall comply with the required changes which are within the scope of the contract requirements to the satisfaction of the government for future production.

- (b) Approval, conditional approval, or rejection of the First Article sample will be given by the PCO. Until the first article sample is approved, further production shall be at the

risk of the contractor. The government will not proceed with acceptance of production lots until first article approval is granted.

5. **Additional First Article Samples:** Additional first article samples may be required by the Contracting Officer as the results of a first article sample failing to meet the contract requirements. Additional first article samples required as a result of first article failure shall be supplied by the contractor at his own expense.
 6. **Disposition of First Article Sample:** All First Article Samples shall be identified, segregated, and retained at the contractor's plant and made available to the government representative, upon request, for the duration of the contract. Final disposition of First Article Sample will be provided prior to contract completion.
 7. **Waiver of First Article** will be at the option of Naval Air Warfare Center Weapons Division (NAWC-WD), Point Mugu, CA 93042-5001.
- B. Lot Acceptance Test (LAT).**
1. Lot Acceptance will be conducted by contractor and/or DCMA and witnessed by DCMA.
 2. Lot Acceptance will be conducted on a lot size no greater than one week's production, but not less than one day's production.
 3. Lot Acceptance will be conducted in accordance with the inspection and test requirements set forth within the technical documentation, this QAP, and the approved ITP and methods.
 4. Should a failure occur during lot acceptance, the contractor shall immediately notify, via the QAR, the contracting office, prior to any rework and reinspection or test.
- C. At conclusion of First Article Testing and Lot Acceptance Testing, the contractor shall prepare test reports in accordance with CDRL requirements.**
- D. A quality system review concurrent with first article test/inspection or first lot acceptance test may be conducted to evaluate the contractor's processes and procedures inherent to the quality of items to be delivered under this contract. The review shall be conducted by government representatives designated by the PCO.**

IV. STATISTICAL PROCESS CONTROL PROGRAM

- A. The contractor's implementation of the SPC program shall be documented in accordance with the applicable CDRL, DID, and this QAP. The following supplemental information shall be considered and used when designing your general and detailed SPC plans.**
1. **General Management Plan:** This section shall define management's SPC responsibilities and involvement and shall include management's commitment to continuous process improvement. The plan shall embrace a total commitment to quality and shall be capable of standing on its own merit.
 - (a) **Policy/Scope:** Describe the Contractor's policy for applying SPC, including goals and management commitment to SPC.

- (b) Applicable Document: List documents that are the basis for the contractor's SPC program (i.e., ANSI standard, textbooks, Government documents).
- (c) SPC Management Structure: Define the SPC management structure within the organization. Identify and include interrelationships of all departments involved in SPC (i.e., Production, Quality, Engineering, Purchasing, etc.) Identify by job title or position all key personnel within departments involved in the application of SPC. Describe which functions are performed by key personnel and when these functions are performed (i.e., include personnel responsible for performing inspections/audits, charting and interpreting data; personnel responsible for determining, initiating and implementing corrective action upon detecting assignable causes, etc.)
- (d) SPC Training: Identify by job title or position the primary individual responsible for overseeing that SPC training is accomplished. Describe the qualification program required and in use for all personnel utilizing SPC techniques, including the qualification of trainers. Identify who is to be trained and the type, extent and length of such training (i.e., on-the-job, classroom, etc.). Identify when refresher training is required and how personnel using SPC techniques are monitored.
- (e) Manufacturing Controls: Identify the criteria for performing SPC gage capability studies and describe how and when these studies are applied. Repeatability and accuracy of gages should be addressed.
- (f) Determination of SPC Use: Describe how the process/operation parameters are determined appropriate for SPC application and explain what actions are taken if SPC is not deemed appropriate for critical and major characteristics and/or process/operation parameters (i.e., Pareto analysis; analysis of characteristics with tight tolerances, etc.)
- (g) Process Stability and Capability:
 - (1) Identify the criteria for performing process capability studies and describe how and when these studies are applied. Describe how the process capability index is calculated and include the frequency of these calculations. Describe what actions are taken as a result of each process capability study. Describe the contractor's methodologies when process capability is for variable and attribute data. To determine a capable process, the process/operation parameters shall meet the following requirements:
 - (i) Variable Data: Process capability (Cp) shall be determined. Process performance index shall be greater than or equal to 1.33 (Cpk). For critical parameters/characteristics, the process performance index shall be greater than or equal to 2.0 (Cpk).
 - (ii) Attribute Data: Process capability/performance shall be the percent beyond the upper/lower specification limit less than or equal to .003 percent (Cpk=1.33).
 - (2) Describe what actions will be taken if process/operation is sub-marginal or marginal. (Cpk less than 1.33 or 2.0 for CRITICALs) or grand average fraction defective is greater than .003 percent).
 - (3) Include analysis of statistical distributions and define all formulas and symbology utilized.
- (h) Control Chart Policy:
 - (1) Type of charts to be used (i.e., \bar{x} /R \bar{x} /S, etc.) and rationale for use; the criteria for selection of sample size, frequency of sampling and rational subgroups.

- (2) Procedures for establishing and updating control limits, including frequency of adjustments.
- (3) Criteria for determining out-of-control conditions (i.e., trends, points beyond control limits, etc.) and the corrective action taken; to include failure analysis when the process is unstable or when nonconforming product has resulted from unstable processes. Illustrate out-of-control tests.
- (4) Describe the method of recording pertinent facts on control charts such as changes in raw material, machines, manufacturing methods and environment, and corrective actions taken and describe how control charts are traceable to the product.
- (i) Vendor/Subcontractor Purchase Controls: Identify whether suppliers are required to utilize SPC and describe the extent the vendor's policies and procedures are consistent with in-house procedures of the prime contractor. Describe the following: methods utilized to determine that suppliers have adequate controls to assure defective product is not produced and delivered; the system utilized to audit suppliers, what will be audited and how often; what action will be taken when out-of-control conditions exist at subcontractor/vendor facilities.
- (j) SPC Audit System: At a minimum, the contractor's SPC Audit System shall consist of auditing compliance with the planned arrangements specified in the general and detailed SPC plans followed by a review and analysis of the outcome to include implementation of necessary corrective action.
- (k) SPC Records: Identify various records to be used in support of SPC and describe their use. Identify retention periods.
- 2. Detailed Plan: This section shall detail specific manufacturing process/operation parameters under control.
 - (a) Control of Process/Operation Parameters or Characteristics: Identify the following for each process/operation by name or characteristic under control:
 - (1) Identify process/operation by name or characteristic and provide rationale for selection; justification for nonselection if the parameter or characteristic is identified as critical and/or major.
 - (2) Describe how the characteristic is produced; the chain of events, type and number of machines involved, location of manufacturing facility, tolerances maintained, etc.
 - (3) Production and inspection machinery used. Include the production rate, number of shifts and length of shifts plus whether inspection is fully or semi-automatic or manual. If manual, identify the type of gages in use.
 - (4) Identify the type of charts to be maintained and whether the process/operation is performed in-house or subcontracted out; identify facility/vendor where process/operation parameters are targeted for SPC.
- B. Reduction or Elimination of Inspection/Test: The PCO will accept submissions of requests for reduction or elimination of final acceptance inspection/testing when the applicable contract and QAP requirements are met. Each request shall contain and/or address the following: control charts documenting twenty (20) consecutive production shifts or more for the same process/operation parameter under control; type of control chart utilized; control chart limits and process average or grand average fraction defective (as applicable); definition of out-of-control condition and corrective actions taken during out-of-control conditions; specification and part number.

V. INSPECTION AND TEST REDUCTION OR ELIMINATION

- A. The government will consider reduction or elimination of acceptance inspection or testing based upon first article and lot acceptance test results when supported by evidence of both process stability and capability. Contractor written requests shall be made through the ACO to the PCO. Approval will be based upon the contractor's quality system plan, statistical process control plan, and validation of the implementation of statistical process control techniques and corresponding results. Upon approval by the PCO, acceptance shall be based upon the approved contractor's statistical process control program and associated statistical techniques.
- B. The government will not consider requests for reduction or elimination of 100% acceptance inspection and testing of parameters or characteristics identified by the designated technical activity as critical which are first order, single point failure modes (nonconformance of the critical parameter or characteristic in and of itself would cause a catastrophic failure.)
- C. The government will consider reduction or elimination of acceptance inspection or test requirements when the following conditions are satisfied:
 - 1. For critical parameter or characteristics other than single point failure modes when evidence is provided of statistical control and a process performance index (Cpk) of at least 2.0.
 - 2. For parameters and characteristics other than critical when evidence is provided of statistical control and a Cpk of at least 1.33.
 - 3. Objective evidence that statistical control and Cpk continue to be evaluated and maintained.
- D. Evidence of loss of statistical control or degradation below a Cpk of 2.00 for criticals or 1.33 for other characteristics shall require immediate corrective action in accordance with the statistical process control program.
- E. Any break in production greater than 90 days shall require a return to normal acceptance inspection and testing.

VI. MAINTAINING PLANS

Plans (e.g., QSP/ITP, SPC) shall be maintained and updated as necessary. All updates (changes/revisions) shall consist of notes or changes to the plan(s), clearly identified as to where applicable (i.e., system element, page, paragraph number, etc.). All updates shall be submitted in accordance with CDRL requirements.

VII. ADDITIONAL REQUIREMENTS

- A. ECPs, VECs, Deviations, and NORs shall be prepared and submitted in accordance with CDRL.
- B. Production progress and Delivery Report (DD Form 375) shall be prepared with instructions listed thereon.

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- C. Contractor shall prepare Ammunition Data Cards in accordance with CDRL and deliver with each deliverable lot.